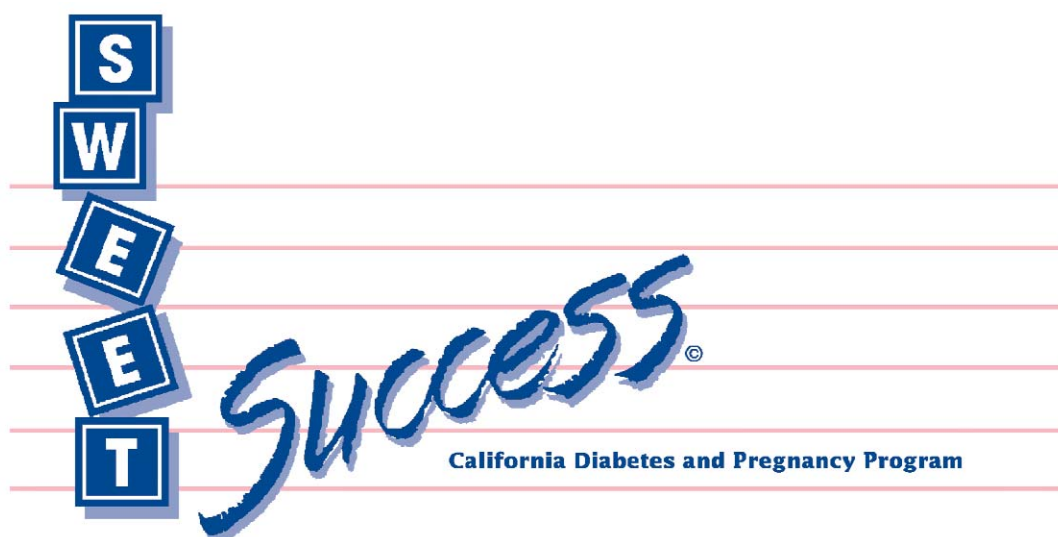


# California Diabetes and Pregnancy Program (CDAPP)

## Data Report 2001-2003



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Without these contributions, the creation of this report  
would not be feasible.

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**EXECUTIVE  
SUMMARY**

The California Diabetes and Pregnancy Program (CDAPP) was established by the Maternal, Child and Adolescent Health Branch of the California Department of Health and Human Services in 1984. The clinical component of CDAPP is the Sweet Success program. Sweet Success program affiliates are providers/clinics throughout California that implement the Sweet Success program's model of care.

One hundred fifty five of the 205 Sweet Success affiliates reported data regarding clients enrolled in the Sweet Success program from 2001-2003. In the years 2001 through 2003, 23,148 women who were pregnant and diagnosed with diabetes participated in diabetes management, education programs, and data collection at Sweet Success affiliate sites throughout the state of California. This data report is a summary profile of this cohort and their diabetes management, delivery methods, and newborns delivered between the years 2001 - 2003.

**Client Characteristics**

- ❖ Most women, eighty-nine percent (88.8%), were 18 to 39 years of age. Approximately eleven percent (11.2%) were in age groups considered to be at-risk for adverse birth outcomes, i.e. women over 40 and under 18.
- ❖ More than half of the women (52.3%) were Hispanic, while one-quarter (22.7%) were White, and one-fifth (19.7%) were of Asian origin. Three percent (3.4%) were African American. Women of Hispanic, Asian and African American ethnicity are at increased risk for gestational diabetes mellitus (GDM).
- ❖ Two thirds (66.3%), of women seen at Sweet Success affiliate sites were either overweight (28.9%) or obese (37.4%) prior to pregnancy, increasing the risk for numerous complications for their baby's health and their own. Many women in Sweet Success programs learned for the first time about the importance of healthy nutrition and portion control as well as appropriate exercise. While Sweet Success care emphasizes health and lifestyle education, many women lacked the social and economic support to adhere to their plan of care.

**Diabetes Diagnosis**

- ❖ Nearly ninety percent (89.4%) of patients were diagnosed with gestational diabetes mellitus (GDM) (diabetes that develops during pregnancy) prior to their first visit to a Sweet Success affiliate site. Seven percent (7.3%) had previously diagnosed type 2 diabetes (adult onset diabetes) and two percent (1.7%) had type 1 diabetes (childhood or adolescent onset).
- ❖ Forty-one percent (41%) of the women with GDM were diagnosed at 24 to 28 weeks gestation, which is the time when GDM is detected due to hormonal and metabolic changes. Women with elevated risk for diabetes in general (see High Risk Factors in Overview Section) should be screened at the earliest prenatal visit to detect undiagnosed type 2 diabetes requiring earlier intervention. About twenty-one percent (21%) of women enrolled in the Sweet Success programs were tested earlier in an effort to meet the needs of this at-risk population.
- ❖ Two fifths of the women, (43%) were diagnosed with GDM later than 28 weeks gestation. As risks for mother and baby complications increase with late diabetes care, emphasis on timely referral to Sweet Success programs continues to be a priority in CDAPP to facilitate optimal birth outcomes. Women with GDM in the Sweet Success program were referred within two weeks of diagnosis (29-30 weeks gestation).

**Diabetes Management**

- ❖ While most women diagnosed with GDM did not require insulin in the first trimester of pregnancy, thirty-one percent (31%) required insulin as the pregnancy proceeded.
- ❖ Data on postpartum reclassification of GDM to type 2 diabetes were submitted on less than forty-two percent (42%) of Sweet Success program clients due to difficulties obtaining the information. Data retrieved showed a four percent (4%) reclassification to type 2 diabetes. The diagnosis of prediabetes was not collected.
- ❖ Contrary to anecdotal reports that GDM is a transitory condition, all women with impaired glucose tolerance (IGT),



which is elevated blood glucose but not high enough to be diagnosed as diabetes (also called pre-diabetes), or with GDM, are at risk for developing type 2 diabetes in the year(s) following the pregnancy. Sweet Success postpartum care includes education about preventing type 2 diabetes with balanced nutrition, and exercise, as well as weight and stress management. Strong efforts continue to reach more women for postpartum follow-up and continued diabetes education.

### **Delivery & Birth Outcome**

- ❖ Fifty eight-percent (58%) of Sweet Success program clients had a vaginal delivery and forty-one percent (41%) had a cesarian delivery (primary or repeat). The high-risk status of the pregnancies might explain the relatively high proportion of cesarian sections.
- ❖ Deliveries are considered “at-term” if they occur between 37 and 41 weeks gestation. More than eighty-nine percent (89.2%) of the deliveries among Sweet Success program clients occurred at-term, with ten percent (10.1%) delivering pre-term (before 37 weeks gestation).
- ❖ Eight percent (8%) of singleton newborn babies were low (LBW) or very low birth weight (VLBW), which poses a significant risk for other complications.
- ❖ Diabetes during pregnancy is often associated with excessive fetal growth, resulting in a large for gestational age (LGA) baby which is defined as an infant having a birthweight that is greater than ninety percent (90%) of other infants with the same gestational age. About twelve percent (12%) of the newborns delivered to women in the Sweet Success program during 2001-2003 were LGA.

### **Congenital Anomalies (Births Defects)**

It is important for women with preexisting diabetes to achieve preconception (before pregnancy begins) normalization of blood glucose levels ( $HgA1c \leq 7\%$ ) to prevent birth defects. A goal of the Sweet Success program is to encourage women with preexisting diabetes to participate in preconception care to normalize blood glucose, obtain optimal weight and receive nutrition counseling. Women with type 1 and type 2 diabetes received preconception care nearly three percent (2.9%) of the

time by Sweet Success programs. However, more than fifty percent (57.5%) were seen in the first trimester. Initial HgA1c levels during the preconception period or in the first trimester demonstrated that almost half of these women entered pregnancy with an HgA1c less than 7%.

## **Conclusion**

### **The Positive Impact of Sweet Success**

The Sweet Success program has made a measurable positive impact in the care of women who have pregnancies complicated by diabetes. A decrease in maternal and neonatal morbidity and mortality of infants born to mothers enrolled in the program is demonstrated by:

**A decrease in preterm deliveries** (10.1%) to nearly match the California average of 9% and 89.2 % of deliveries occurring at term (between 37 and 41 weeks gestation). Historically, women with pregnancy complicated by diabetes were delivered prior to 36 weeks gestation to prevent fetal death between 36 weeks and 40 weeks gestation. The intensive multidisciplinary team management of the Sweet Success program enables the women to safely carry her pregnancy to term without unnecessary preterm delivery. This significantly decreases morbidity from prematurity for example RDS requiring lengthy NICU stays.

**A decrease in SGA and LGA rates for infants of mothers with IGT or GDM.** Analysis of singleton babies born of mothers with GDM and IGT who were low birthweight or very low birth weight was 7%- the same rate as all California births during that period of time. LGA and macrocosmic infants born to women with IGT or GDM was 11 % similar to the California average of 10.7%. Since SGA and LGA infants can have significant complications and lengthy NICU stays, normalizing the rate of SGA represents a cost saving of NICU stays immediately after birth. Moreover both SGA and LGA infants are more likely to have impaired carbohydrate intolerance, diabetes, and its associated cardiovascular complications later in life. Therefore, decreasing the number of SGA and LGA infants represents a potential future improvement in these public health epidemics

### **Opportunities for improvement:**

Examining the data reveals opportunities for improvement in the Sweet Success program. Focus areas should include:

**Reduction in SGA and LGA/ Macrosomic rates in women with pre-existing diabetes.** At present the SGA and LGA/Macrosomic rates for our women with pre-existing diabetes still have not decreased to equal the non-diabetic population. Innovative strategies to reach these women prior conception are still required. Moreover, aggressive prenatal education and management must be maintained throughout the entire pregnancy to optimize maternal-fetal outcomes of this high-risk population.

**Improving entry and access to care:** Fully twenty-five (25%) of women enter the program after 32 weeks gestation. Ideally, diagnosis of GDM occurs between 24 and 28 weeks gestation and entry into the program should be accomplished within one week. This provides the maximum amount of time to optimize maternal blood glucose levels and positively impact maternal and fetal health. By entering into care after 32 weeks gestation, the amount of time to reduce neonatal complications such as macrosomia decreases. Access to care for underserved women, in particular African-American women is an area the program has targeted for future growth.

**Preconception counseling for those women with pre-existing diabetes:** Although women with preexisting type 1 and type 2 diabetes entered the Sweet Success program with HgA1c of 7% or below, only three percent (3%) of these women statewide acknowledged entering the Sweet Success program for preconception care. Efforts to educate women with type 1 diabetes need to continue by interacting with endocrinologists, OB/GYN's and family practice physicians who care for these patients. Further, the epidemic of obesity and type 2 diabetes in women of childbearing age is disproportionately reflected in our population with 66% percent of the women in the program were either overweight or frankly obese. Comprehensive preconception care needs to include not only optimum blood glucose control, but weight management, and information regarding the adverse effect of maternal overweight on maternal and fetal outcomes. This form of comprehensive preconception care remains a non-covered service by many insurance companies. To tackle this issue, a more universal approach to educating insurance payers regarding the cost benefits of this approach and partnering with the National Diabetes Education Program, Small Steps Big Rewards may enable the Sweet Success program to reach women of childbearing age to provide this preconception care.

**Postpartum Follow-up:** Obtaining information from Sweet Success participants regarding postpartum diabetes diagnosis remains an opportunity for improvement. More than half, fifty-eight percent (58%), of the women with GDM or IGT had unknown postpartum glucose levels. Barriers to obtaining this information such as client lost to follow-up, no insurance coverage for this test, delaying the testing inappropriately due to breastfeeding, healthcare providers not initiating the test, or less sensitive tests such as fasting blood glucose tests being used. Prompt and appropriate diagnosis of postpartum IGT or type 2 diabetes is essential for the woman with a history of GDM or IGT during pregnancy. By identifying women who have IGT or type 2 diabetes, the woman can receive appropriate medical treatment to impact the dual epidemic of diabetes and obesity. This follow-up also provides an ideal opportunity for preconception counseling for future pregnancies.

**Continued increase in the number of affiliates submitting data.** Only 50% of affiliates submitted data during this collection period. This contributes to underreporting of the number of women who have pregnancy complicated by diabetes and the maternal-fetal outcomes of this population.

# *Introduction*

## **Diabetes**

Diabetes is a serious health condition that affects women in all life stages. In the United States, approximately 1.85 million women of reproductive age (18-44 years) have diabetes; nearly 500,000 of whom do not know they have the disease.<sup>4</sup> The effect of diabetes on women is unique because it can affect not only the woman's health, but that of her unborn child(ren), as well as her children's lifelong health.<sup>8, 22, 24, 32</sup> The death rates for women ages 25-44 years who have diabetes are more than three times higher than the rate for women without diabetes.<sup>4</sup> It is estimated that one in three American children born in 2000 will develop type 2 diabetes during their lifetime.<sup>53</sup>

## **Obesity**

Obesity is a national epidemic. Rates of obesity and diabetes continue to rise in the United States. The National Institutes of Health (NIH) reported a 5.6% increase in obesity (Body Mass Index > 30) and an 8.2% increase in diabetes from 2000-2001.<sup>36</sup> The association of obesity and the development of long term, chronic diseases including diabetes is well documented in scientific literature regarding metabolic syndrome.

## **Metabolic Syndrome**

Metabolic syndrome (also referred to as "insulin resistance syndrome" and "syndrome X") is a grouping of several disorders of the body's metabolism, such as obesity, high blood pressure, and high cholesterol. This syndrome affects at least one out of every five overweight people. Metabolic syndrome can lead to complications including hardening of the arteries, and increased risk for cardiovascular (heart and blood vessels) and kidney disease. People with one component of the syndrome are at increased risk for also developing one or more of the other components. The greater the number of components, the greater the health risks.<sup>5, 6, 14, 15, 17, 19, 20, 34, 41, 45</sup> Obesity worsens insulin resistance, making it increasingly difficult for cells to respond to insulin. The body reacts by releasing more insulin to "override" the insulin resistance. When the body can't produce enough insulin to overcome insulin resistance, blood glucose levels rise, ultimately leading to diabetes.<sup>15, 41</sup>

## DIABETES AND PREGNANCY

### Overview

When diabetes complicates a pregnancy, perinatal mortality and morbidity are significantly increased, as is the risk for future metabolic disturbances in the mother as well as the child(ren).<sup>1-4, 6, 8, 10, 11, 13, 14, 18, 22-24, 26-29, 32, 38, 39, 40, 42-44, 48, 49</sup>

Preconception care, as well as coordinated multidisciplinary care throughout pregnancy and postpartum, which includes consistent blood glucose control, healthy lifestyles and careful anticipatory care, may reduce these risks.<sup>3, 4, 8, 13, 14, 18, 22, 24, 32, 33, 47</sup>

Women with preexisting diabetes are at risk for worsening of established nephropathy (kidney disease), retinopathy (eye disease) and cardiovascular disease.<sup>3, 13-15, 17, 18, 47</sup> Women with both pregestational and GDM, face a greater risk of preeclampsia (high blood pressure during pregnancy), pyelonephritis (inflammation and infection of the kidney), hydramnios (excess amniotic fluid), preterm birth (less than 37 weeks gestation), cesarean delivery and birth trauma.<sup>3, 4, 10, 18, 22, 24, 33, 45-47</sup>

Women diagnosed with GDM have a 3-70% chance of developing pre-diabetes or type 2 diabetes after having GDM.<sup>21</sup> Women can decrease their risk or delay the onset of pre-diabetes or type 2 diabetes by addressing modifiable risk factors. These factors are optimal body weight, activity/exercise level, healthy meal planning, breastfeeding, decreasing the use of medications that increase insulin resistance and parity (from the first diagnosis of GDM).<sup>7, 9, 20, 21, 25, 34, 36</sup> Women diagnosed with GDM have up to a 50% risk of recurrence with the next pregnancy.<sup>2, 27</sup> Screening for pre-diabetes or type 2 diabetes is recommended before a woman attempts her next pregnancy, thereby reducing the incidence of women with undiagnosed diabetes with hyperglycemia, leading to birth defects.

GDM is most common in women who:<sup>2, 31, 38</sup>

- ❖ Have a first degree relative with diabetes;
- ❖ Are obese;
- ❖ Are from one of the following ethnic groups: American Indian, African American, Hispanic, Asian/Pacific Islander;
- ❖ Have had a previous baby weighing more than nine pounds;
- ❖ Had a previous baby that died before birth (still birth);
- ❖ Have polycystic ovarian syndrome<sup>3</sup> ; and/or
- ❖ Have chronic use of medications that increase the risk of diabetes (e.g. steroids).

Major congenital malformations remain the leading cause of mortality and serious morbidity in infants of mothers with preexisting diabetes (type 1 or type 2 diabetes).<sup>3, 18, 22, 24, 32, 33</sup>

Children of women with diabetes, either pregestational (preexisting) or GDM, are at increased risk for morbidity associated with hyperglycemia including organomegaly (organs that are excessively large), macrosomia (large birthweight associated with central adiposity or fat), hydramnios (excessive or too little amniotic fluid), delayed lung maturation, birth injury, cesarean birth, newborn hypoglycemia (low blood glucose), polycythemia (excess red blood cells), hyperbilirubinemia (elevated concentrations of toxins produced as blood cells are destroyed), extended newborn hospitalization and interruption in normal bonding and establishment of breastfeeding.<sup>1, 10, 11, 13, 17, 18, 23, 46,</sup>

<sup>52</sup> Stillbirths occur more often in pregnancies complicated by hyperglycemia.<sup>1, 10, 11, 13, 26, 40</sup>

Recent research indicates that when a woman is hyperglycemic during pregnancy, abnormal pancreatic fetal programming permanently resets fetal metabolism and gene expression. This results in newborn and childhood insulin resistance and adolescent glucose intolerance, hypertension (elevated blood pressure), obesity, cardiovascular disease and diabetes.<sup>6, 43, 44, 48, 49</sup> Type 2 diabetes is more common in children of women with uncontrolled type 1 diabetes, type 2 diabetes or GDM.<sup>6, 43, 44, 48, 49</sup>

### **Blood Glucose Control**

Health consequences related to diabetes and pregnancy justify an intensive effort to target this group for treatment to achieve glucose control during preconception, pregnancy, postpartum and beyond.<sup>21</sup> This short period of intensive blood glucose control and care affects the child(ren)'s health for their lifetime. Interventions during preconception, pregnancy, postpartum and beyond also impact a woman's health for both herself and her family well beyond her pregnancy. This is one point where prevention by healthcare providers and women with either preexisting or GDM, can reduce the lifetime risk for themselves and their child, from chronic diseases such as insulin resistance and diabetes, obesity, hypertension and heart disease.<sup>7, 9, 12, 15, 17, 20, 21, 25, 34, 36, 41, 45, 53, 54</sup>



### **The California Diabetes and Pregnancy Program (CDAPP) and Sweet Success**

Women in California who experience diabetes in pregnancy should receive comprehensive, accurate and culturally appropriate education to maximize diabetes management.

The California Diabetes and Pregnancy Program (CDAPP) was established by the Maternal, Child and Adolescent Health Branch of the California Department of Health Services as part of the Regional Perinatal Programs of California (RPPC) in 1984. CDAPP's goal is to achieve optimal metabolic control with outcomes near or equal to the population without diabetes during pregnancy. CDAPP's mission is health education, health promotion, and prevention of complications for women who have pre-existing diabetes or GDM. This goal and mission are achieved by following the evidence based, 2002 Sweet Success Guidelines for Care<sup>31</sup> as the foundation for diabetes and pregnancy services. The clinical component of CDAPP is the Sweet Success program.

CDAPP's scope of work includes:

- ❖ Establishing and maintaining Sweet Success program affiliate sites that promote optimal management of diabetes before, during and after pregnancy, in all women;
- ❖ Encouraging the utilization of interdisciplinary Sweet Success health care teams to provide educational, research-based, culturally appropriate, prevention and health promotional strategies as outlined by the Sweet Success Guidelines for Care; and
- ❖ Utilizing outcome data collected from affiliate sites to educate professionals on the effectiveness of evidence-based diabetes and pregnancy care.

The Sweet Success program is based on the use of a multidisciplinary team approach to care that integrates targeted assessment and intervention strategies to provide optimal management for preconception, pregnant, and postpartum women with diabetes. CDAPP affiliates are providers throughout California that implement the Sweet Success model of care. There are approximately 205 Affiliates throughout California's 12 Regional CDAPP Programs.



The Sweet Success model of care emphasizes:

- ❖ Early referral into diabetes and pregnancy programs;
- ❖ Provision of outpatient-based comprehensive client education, nutrition, psychosocial and medical services; and
- ❖ Active client participation in managing diet, exercise and medication regimens necessary for optimal blood glucose control.

Sweet Success program goals include:

- ❖ Improve care for women with diabetes or GDM so pregnancy outcomes approximate those of women without diabetes with respect to:
  - Birth defects,
  - Intrauterine growth patterns, and
  - Complications such as cesarean delivery, extra days in the hospital for the newborn, etc.;
- ❖ Active client participation in managing diet, exercise and medication regimens necessary for optimal blood glucose control; and
- ❖ Prevention of pre-diabetes and diabetes in all women who develop GDM and their offspring, using interventions such as breast feeding, normalizing weight, and exercising daily.

These goals are consistent with the purposes of the Title V funded Maternal, Child and Adolescent Health Branch Programs.

The purpose of this report is to describe information on women receiving Sweet Success care as well as their risk factors and birth outcomes. This information is intended to demonstrate ways in which the Sweet Success model of care impacts pregnancy outcomes in women diagnosed with diabetes.

# *Methodology: Data Collection, Reporting and Analysis*

This report is based on data collected and submitted by 105 of the 205 Sweet Success affiliate sites throughout California whose patients gave birth between January 1, 2001 and December 31, 2003. The data submitted contains no information that would identify the individual receiving care. There are approximately 205 Sweet Success program affiliate sites throughout California, however not all sites routinely collect and submit data on all clients, thus it is not possible to quantify the total number of CDAPP clients served during this reporting period.

Generalizations can not be made regarding all women in California with pre-existing or gestational diabetes, based on this data alone. Given these limitations, outcomes represented in this report reflect practice within Sweet Success affiliated sites that submitted data during 2001 to 2003.

## **Data Sources**

A standardized data collection tool was used from 2001 through 2003 (Appendix A - Data collection tool). The tool contained 37 items, necessitating fixed choice or short responses. Content verification of the tool was supported through the use of an expert panel and field testing. A data manual and training was provided to each Sweet Success Affiliate to optimize accuracy of the data collected.

## **Analysis Limitations**

The data set was evaluated in three subsets:

- 1) maternal utilization of care, demographics, and outcomes using all available, unduplicated reports of maternal clients including those who experience a pregnancy loss ♦ (n=23,148);
- 2) weight, size and gestation of offspring, including only singleton births after the 20th week of gestation • (n=20,600); and

- 3) offspring (fetal and neonatal) demographics and outcomes using all available, unduplicated reports of offspring born to mothers who received care at a Sweet Success affiliate site (including: singleton live births, all siblings of multi-fetal pregnancies and all known fetal deaths occurring after the 20th week of gestation). ✦ (n=21,462)

From 2001 to 2003, 23,587 data forms were collected representing 23,148 maternal clients with type 1 diabetes and type 2 diabetes, GDM and IGT and 21,453 offspring (fetus and infants delivered after 20 weeks of gestation), including all siblings of multifetal pregnancies. Significant increases in both the number of affiliates and clients served were noted during the reporting period compared to the previous year.

Data sets with unknown pregnancy outcomes and/or incomplete data were excluded in this analysis (n = 439), therefore, only 23,148 data forms were analyzed. Only data sets for the 21,462 offspring who reached viability (more than 20 weeks gestation) were analyzed to provide congenital anomaly rates.

**Table 1: SWEET SUCCESS PROGRAM CLIENTS, 2001 - 2003\***  
**Pregnancy Outcomes**

	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2001-2003</b>
<b>Records (total)*</b>	2,262	9,690	11,635	<b>23,587</b>
<b>Maternal clients (total)◆</b>	2,223	9,517	11,408	<b>23,148</b>
Spontaneous loss (prior to 20 wks gestation)	122	944	1,058	<b>2,124</b>
Delivering (after 20 weeks gestation)	2,101	8,573	10,350	<b>21,024</b>
Singleton pregnancies	2,063	8,404	10,133	<b>20,600</b>
Multi-fetal pregnancies	38	169	217	<b>424</b>
<b>Offspring (fetus/infant &gt;20 weeks gestation) (total)✦</b>	2,140	8,746	10,576	<b>21,462</b>
Singleton births •	2,063	8,404	10,133	<b>20,600</b>
Multiple births	77	342	443	<b>862</b>
Twins	74	330	420	<b>824</b>
Triplets	3	12	18	<b>33</b>
Quadruplets	0	0	0	<b>0</b>
5 fetus	0	0	5	<b>5</b>

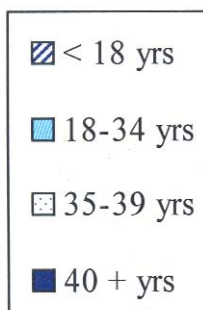
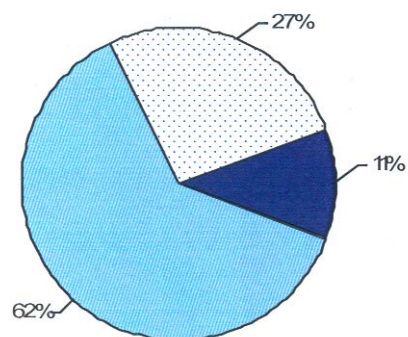
\*Records include cases with unknown pregnancy outcome and/or gestational age. Columns will not total.

# *Maternal Age at Delivery*

Women 30 years of age and older are at increased risk of developing diabetes.<sup>3</sup> Women less than 18 or over 40 years of age can be at greater risk for pregnancy complications that are caused by and/or made worse by diabetes. These risks include premature labor and birth, pregnancy induced hypertension, and death of the mother and/or baby.<sup>30, 35, 37</sup>

- ❖ Sixty-two-percent (62.0%) of women in the Sweet Success program with known age at the time of delivery, were 18 to 34 years of age and nearly twenty-seven percent (26.8%) were 35 to 39 years of age.
- ❖ Few Sweet Success program clients were less than 18 years of age at time of delivery (0.2%).
- ❖ Eleven percent (11%) of the Sweet Success clients were 40 years or older, including nearly one percent (1%) who were at least 45 years of age at time of delivery.
  - Comparing the reported maternal age at delivery for Sweet Success program clients to California maternal age at delivery for the same reporting period, there are proportionally more older women (> 35 years of age) receiving care in the Sweet Success program than are seen in the general California birth population.

**Figure 1, Table 2: SWEET SUCCESS PROGRAM CLIENTS, 2001 - 2003:**  
**Maternal Age at Delivery♦ (n =23,148)**

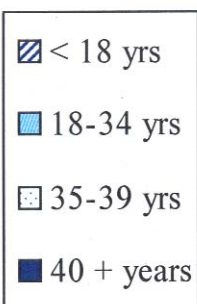
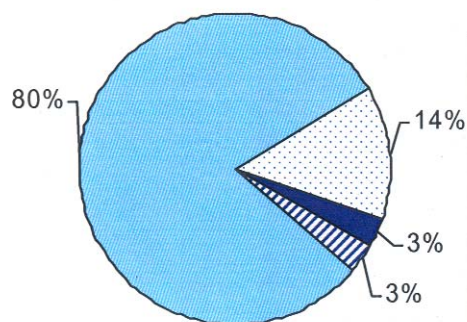


	Number	Percent Known
< 18 yrs	58	0.2%
18-34 yrs	12,797	62.0%
35-39 yrs	5,525	26.8%
> 40 yrs	2,261	11.0%
<b>Subtotal</b>	<b>20,641</b>	<b>100.0%</b>
Unknown*	2,507	
<b>Total</b>	<b>23,148</b>	

\*unknowns excluded from graphic

Source: CDAPP Data, 2001-2003

**Figure 2, Table 3: CALIFORNIA, 2001-2003: Maternal Age at Delivery (n = 1,598,745)**



	Number	Percent Known
< 18 yrs	49,561	3.1%
18-34 yrs	1,282,194	80.2%
35-39 yrs	219,028	13.7%
> 40 yrs	47,962	3.0%
<b>Total</b>	<b>1,598,745</b>	<b>100.0%</b>

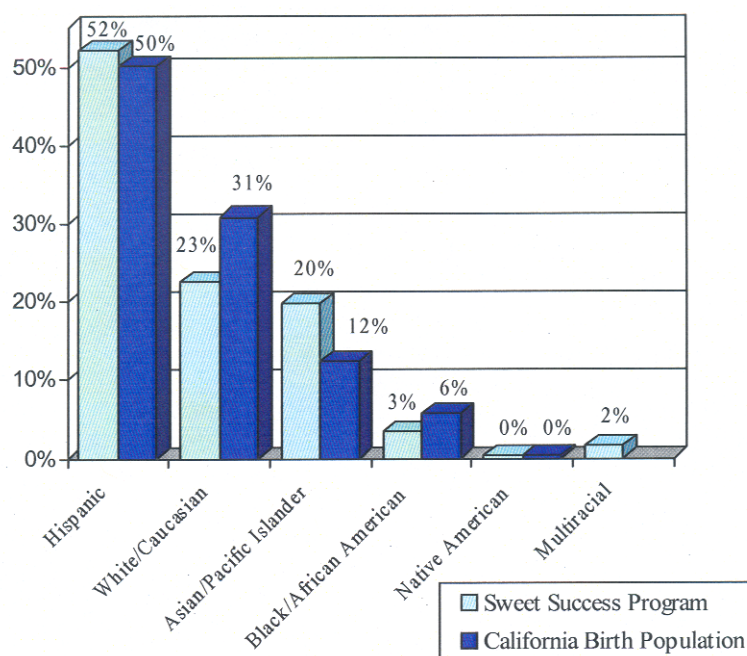
Source: California Vital Statistics, Birth Certificate Files, 2001-2003

**RACE &  
ETHNICITY**

Women of Hispanic, Native American, Asian, and African American ethnic backgrounds have a disproportionately high rate of GDM nationwide.<sup>2, 4, 16, 30, 35</sup>

- ❖ Approximately fifty-two percent (52.3%) of patients seen in the Sweet Success program were of Hispanic origin. Other ethnic groups represented in large numbers included nearly twenty-three percent (22.7%) White and approximately twenty percent (19.7%) Asian/Pacific Islanders.
- The reported proportion of women of Hispanic and Asian/Pacific Islanders heritage participating in the Sweet Success program is higher than the general California birth population as expected given the incidence of diabetes in these populations.

**Figure 3: SWEET SUCCESS PROGRAM CLIENTS, 2001 - 2003 & California Vital Statistics, 2001-2003: Maternal Race and Ethnicity♦ (n =23,148 & n =1,598,745)**



Source: CDAPP Data, 2001-2003; California Vital Statistics, Birth Certificate Files, 2001 - 2003

**Table 4: SWEET SUCCESS PROGRAM CLIENTS, 2001-2003:  
Maternal Race and Ethnicity♦ (n =23,148)**

	Number	Percent Known
Hispanic	11,740	52%
White	5,094	23%
Asian/Pacific Islander	4,433	20%
Black/African American	758	3%
Native American	69	0%
Multiracial	355	2%
<b>Subtotal</b>	<b>22,449</b>	<b>100%</b>
Unknown*	699	
<b>Total</b>	<b>23,148</b>	

\*unknowns excluded from graphic

Source: CDAPP Data, 2001-2003

**Table 5: CALIFORNIA VITAL STATISTICS, 2001-2003:  
Maternal Race and Ethnicity (n = 1,598,745)**

	Percent Known
Hispanic	50%
White	31%
Asian/Pacific Islander	12%
Black/African American	6%
Native American	0%
<b>Total</b>	<b>99%</b>

Source: California Vital Statistics, Birth Certificate Files, 2001 - 2003

## PRE-PREGNANT BODY MASS INDEX

Maintaining ideal body weight is important in preventing and managing diabetes. The Body Mass Index (BMI), is used to categorize body size and weight while providing a standardized system for evaluating risk. BMI is calculated using height and weight, which provides an estimate of an individual's body fat. The BMI is directly related to health risks. A pre-pregnancy BMI greater than 25 is strongly linked to the development of diabetes both within and following pregnancy.

BMI categories based on Institute of Medicine recommendations are:

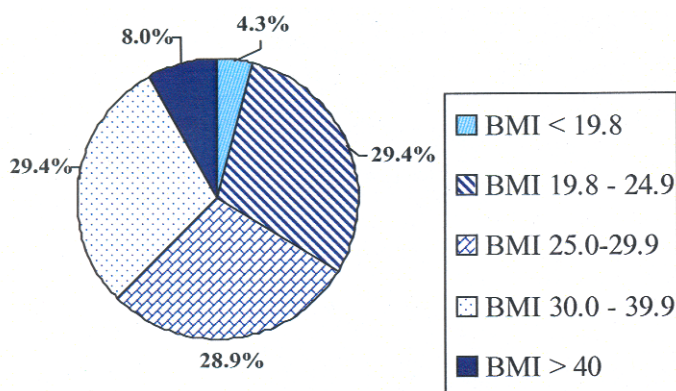
- Underweight BMI < 19.8
- Normal Weight BMI 19.8 - 24.9
- Overweight BMI 25.0 - 29.9
- Obese BMI 30.0 - 39.9
- Morbidly Obese BMI > 40.0

Obesity and diabetes are strongly related. A BMI greater than 30 is related to a three fold increase in diabetes; and a BMI greater than 40 is associated with a seven fold increase in diabetes. <sup>34, 36, 54</sup>

Maternal obesity is a strong predictor of babies born large for gestational age (LGA), defined as larger than 90% of babies born at the same gestational age, or weighing more than 8 pounds, 12 ounces. <sup>6, 36, 54</sup>

- ❖ Approximately one-third (29.4%) of Sweet Success clients seen in 2001-2003 were obese prior to pregnancy (BMI >30), eight percent (8%) were morbidly obese (BMI >40.0), while approximately four percent (4.3%) were underweight (BMI <19.8).

**Figure 4, Table 6: SWEET SUCCESS PROGRAM CLIENTS, 2001-2003:  
Pre-Pregnancy Body Mass Index (BMI)♦ (n =23, 148)**



BMI	Number	Percent Known
< 19.8	926	4.3%
19.8 - 24.9	6,318	29.4%
25.0 - 29.9	6,202	28.9%
30.0 - 39.9	6,321	29.4%
> 40.0	1,708	8.0%
<b>Subtotal</b>	<b>21,475</b>	<b>100.0%</b>
Unknown*	1,673	
<b>Total</b>	<b>23,148</b>	

\*unknowns excluded from graphic

Source: CDAPP Data, 2001-2003



**DIABETES  
DIAGNOSIS AND  
MANAGEMENT AT  
FIRST SWEET  
SUCCESS VISIT**

Nationwide, one in 200 women of childbearing age has preexisting diabetes.<sup>28</sup> Fetal exposure to hyperglycemia can cause congenital anomalies, disproportionate growth, and other significant consequences.

- ❖ Nine percent (9%) of women in the Sweet Success program have preexisting diabetes; nearly two percent (1.7%) have type 1 diabetes and seven percent (7.3%) have type 2 diabetes.

GDM is most commonly diagnosed at 24 to 28 weeks (about 6.5 months) gestation. Pregnancy hormones begin to have the strongest effect on carbohydrate (foods that turn into sugar) metabolism at this time. This causes excess glucose to remain in the mother's blood which is passed directly to her baby. GDM is most often managed by healthy eating and exercise, and less often by adding insulin.

When GDM is detected early in pregnancy (before 24 weeks gestation) it may be related to underlying impaired glucose metabolism. This may result in the need for early insulin therapy and closer monitoring postpartum for the presence of pre-diabetes (blood glucose values which exceed the normal values, but do not reach the diabetes diagnostic values). Women with elevated risk for diabetes should be tested at the first prenatal visit and again at 24 to 28 weeks gestation if the first test results were normal.

- ❖ Two-thirds of women (66.9%) with GDM in the Sweet Success program were effectively managed by diet alone throughout pregnancy. Other intervention plans included diet and oral hypoglycemic agents (3.1%) or diet and insulin (30%) by the time of delivery.

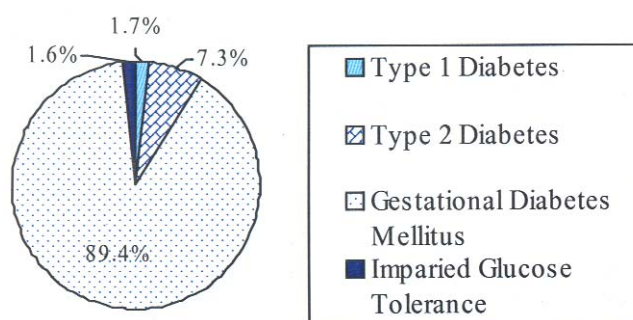
GDM is usually diagnosed by a positive screening test followed by a three hour oral glucose tolerance test (OGTT) with two abnormally high results.<sup>38</sup> Impaired Glucose Tolerance (IGT) is diagnosed when only one result is abnormal. Women with IGT have outcomes that are similar to women with GDM, thus counseling for healthy diet, Self Monitoring of Blood Glucose (SMBG), exercise, and postpartum follow-up are recommended.<sup>26</sup>

- ❖ Nearly two percent (1.6%) of women in the Sweet Success program are initially diagnosed with IGT. Plan of care for these women is very similar to that of the GDM women, and included Medical Nutrition Therapy (MNT), exercise, and

SMBG with follow-up by the Sweet Success affiliated sites.

- ❖ Most patients (89.4%) seen in a Sweet Success program have a GDM diagnosis at the first Sweet Success program visit.

**Figure 5, Table 7: SWEET SUCCESS PROGRAM CLIENTS, 2001-2003:  
Diabetes Diagnosis at First Program Visit ♦ (n =23,148)**



	Number	Percent
Type 1	389	1.7%
Type 2	1,674	7.3%
Gestational Diabetes Mellitus	20,400	89.4%
Impaired Glucose Tolerance	358	1.6%
<b>Subtotal</b>	<b>22,821</b>	<b>100.0%</b>
Unknown*	327	
<b>Total</b>	<b>23,148</b>	

Source: CDAPP Data, 2001-2003

## GESTATIONAL AGE AT ENTRY INTO SWEET SUCCESS CARE

The point at which diabetes is diagnosed and clients begin receiving optimal medical, diet, exercise and diabetes management services impacts the outcome of pregnancy. The earlier management begins, the greater the potential to prevent complications.

- ❖ More than one-third (36%) of women entered care in the Sweet Success program between 24 and 28 weeks gestation. An additional one-third (34%) entered care at a Sweet Success affiliate site between 29 and 32 weeks gestation.

Women with pre-existing diabetes (type 1 and type 2 diabetes) are encouraged to receive preconception care to carefully plan and time pregnancy. Normalizing and maintaining normal blood glucose levels long term or a HgA1c less than 7% before conception has been shown to reduce the risk of birth defects.<sup>14, 22, 24, 32</sup> Normalization of body weight and healthy nutrition can reduce risks to both the mother and her child(ren).

- ❖ Few women, three percent (3%), with pre-existing diabetes (type 1 and type 2) entered care at a Sweet Success program before conceiving (preconception care). However, more than half (57%) of the women with type 1 and type 2 were seen within the first trimester (13 weeks) of pregnancy.
- ❖ Forty percent (40%) of women with pre-existing diabetes had HgA1c levels that were less than 7% (ranging from 3.1-15.8) at their first Sweet Success program visit. A HgA1c value less than 7% is consistent with preconception normalization of blood glucose for women with preexisting diabetes.

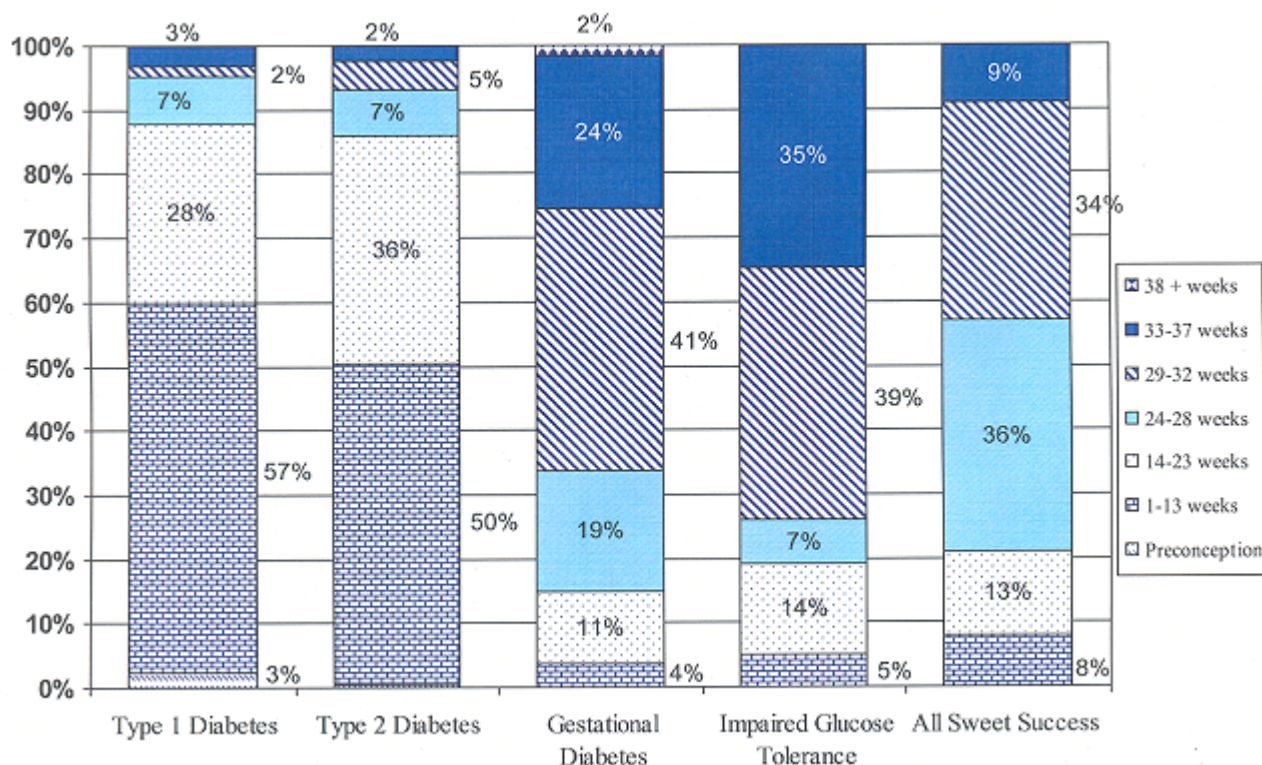
GDM and IGT usually become apparent between 24 and 28 weeks gestation, thus current practice standards include testing at approximately 28 weeks gestation for most women. Risks for mother and baby increase with late diabetes care. Entry into care in the Sweet Success program usually occurs within 1-2 weeks of GDM diagnosis. Prompt referral and entry into specialty care is particularly important to impact complications from macrosomia. Of the women seen at Sweet Success Affiliate Sites:

- ❖ Approximately fifteen percent (14.9%) of GDM clients entered care prior to 24 weeks gestation demonstrating that healthcare providers are screening and referring high risk women appropriately.
- ❖ Nearly nineteen percent (18.7%) entered the Sweet Success program between 24 and 28 weeks gestation.
- ❖ An additional forty-one percent (40.8%) entered Sweet Success program care between 29 and 32 weeks gestation.

- ❖ Fully one-quarter (25.5%) received Sweet Success program care after 32 weeks of gestation.

It is difficult to assess timeliness of referral and entry into Sweet Success program care since the exact gestation at diagnosis is not well reported (unknown greater than forty percent [40%]). Testing

**Figure 6: SWEET SUCCESS PROGRAM CLIENTS, 2001-2003: Entry into Sweet Success Program Care by Type of Diabetes and Week of Gestation ♦ (n = 23,148)**



Source: CDAPP Data, 2001-2003

**Table 8: SWEET SUCCESS PROGRAM CLIENTS, 2001-2003: Entry into Sweet Success Program Care by Type of Diabetes and Week of Gestation ♦ (n = 23,148)**

	Precon- ception	1-13 weeks	14-23 weeks	24-28 weeks	29-32 weeks	33-37 weeks	38 + weeks
Type 1 Diabetes	2.5%	57.4%	27.9%	7.4%	1.6%	3.3%	0
Type 2 Diabetes	0.4%	50.1%	35.5%	7.2%	4.5%	2.3%	0
Gestational Diabetes	0	3.6%	11.3%	18.7%	40.8%	23.9%	1.6%
Impaired Glucose Tolerance	0	5%	14%	7%	39.3%	34.6%	0
All Sweet Success	0	8%	13%	36%	34%	9%	0

Source: CDAPP Data, 2001-2003

## POSTPARTUM DIABETES DIAGNOSIS

All women with GDM are at increased risk for type 2 diabetes and should be tested postpartum (approximately 6 to 8 weeks after giving birth) as well as annually for life.

Postpartum Impaired Glucose Tolerance (IGT), is diagnosed when one of the lab values of the 75 gram 2 hour oral glucose tolerance test (OGTT) is abnormal (see table 9). IGT is considered the best predictor of conversion to type 2 diabetes and metabolic syndrome. Metabolic syndrome is defined as clinically significant elevations in blood glucose and/or lipids, blood pressure and weight. Type 2 diabetes and metabolic syndrome, predict future medical complications such as cardiovascular disease.<sup>15, 17, 20, 41</sup>

- ❖ More than half, fifty-eight percent (58%), of women with GDM or IGT for whom data was received, had unknown postpartum glucose levels. Several barriers to collecting this data include:

- client lost to follow-up,
- client received follow-up but testing results were unavailable,
- testing delayed inappropriately due to breastfeeding, and
- less sensitive testing method selected (i.e. fasting blood glucose only, random blood glucose, or HgA1c).

These issues are important barriers to appropriate diagnosis and early and consistent management of diabetes both for the woman and her future children.

- ❖ Of those clients with known postpartum glucose tolerance lab results, ninety-five percent (95%) of those diagnosed with GDM during this pregnancy had normal glucose tolerance results. Five percent (5%) of women with GDM were diagnosed with type 2 diabetes postpartum.

**Table 9: DIAGNOSING DIABETES<sup>31</sup>**

Normal	Prediabetes	Diabetes Mellitus*
Fasting < 100 mg/dL	FPG** ≥ 100 mg/dL - 125 mg/dL	FPG ≥ 126 mg/dL
2h PG*** < 140 mg/dL	2h PG > 140 mg/dL - 199 mg/dL (IGT))	2h PG ≥ 200 mg/dL

\* In the absence of unequivocal hyperglycemia and acute metabolic decompensation, these criteria should be confirmed by repeat testing on a different day.

\*\* FPG - Fasting Plasma Glucose

\*\*\* 2h PG - 2 hour Post Load Glucose



**METHOD OF DELIVERY**

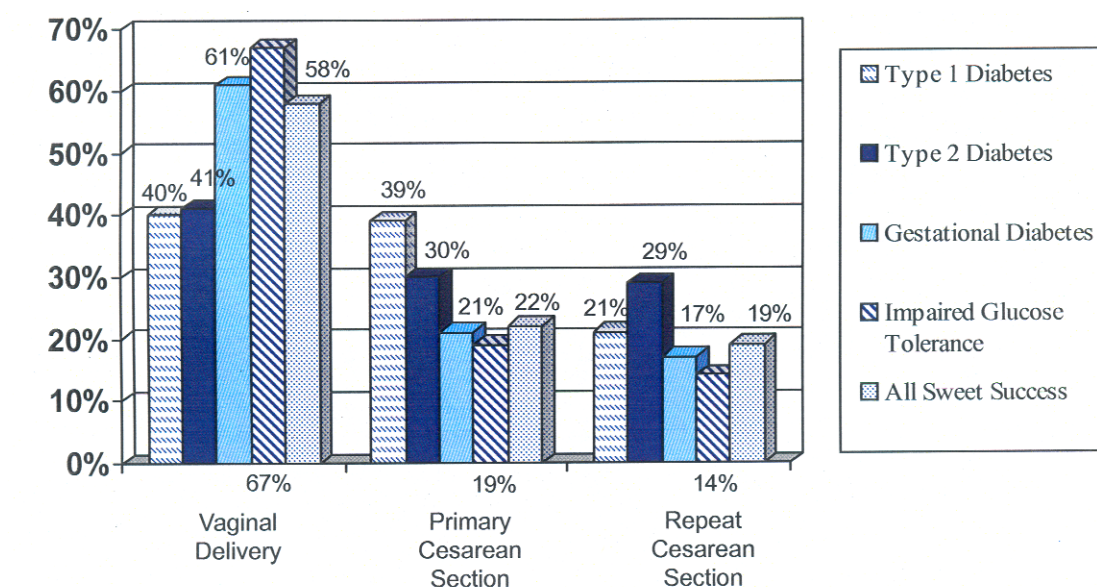
Women with poorly controlled diabetes are at increased risk for complications during labor and delivery. Factors influencing the method of delivery include: the size of the infant; the presence of complications (such as pregnancy induced hypertension, high blood pressure, or decreased/increased amounts of amniotic fluid); the mother's or infant's ability to tolerate the stress of labor; and/or maternal and physician delivery preference. Nationwide, women with diabetes are three to four times more likely to have a cesarean delivery.<sup>4</sup>

The CDAPP data reports four methods of delivery: vaginal; vaginal birth after previous cesarean section (VBAC); and either primary or repeat cesarean section (Primary C/S or Repeat C/S). Overall cesarean delivery rates are reported as the combined total of both Primary and Repeat C/S.

Between 2001 and 2003, the average Primary C/S rate for the State of California was sixteen percent (16%).<sup>50, 51</sup>

- ❖ Nearly three-fifths (58%) of the Sweet Success program clients delivered vaginally, while twenty-two percent (22%) delivered by Primary C/S and nineteen percent (19%) by Repeat C/S. The total C/S rate was a little over forty-one percent (41%). Less than one percent of women in the Sweet Success program delivered by VBAC.
- ❖ Delivery method varies greatly by type of diabetes. The Sweet Success program population with type 1 and type 2 diabetes had a thirty-nine percent (39%) and thirty percent (30%) primary C/S rate, while those with GDM or IGT had rates of twenty-one percent (21%) and nineteen percent (19%), respectively. Repeat C/S was also significantly higher in women with type 2 diabetes at a reported twenty-nine percent (29%) vs. GDM seventeen percent (17%).

**Figure 7: SWEET SUCCESS PROGRAM CLIENTS, 2001-2003:**  
**Method of Delivery by Type of Diabetes♦ (n =23,148)**



Source: CDAPP Data, 2001-2003

**Table 10: SWEET SUCCESS PROGRAM CLIENTS, 2001-2003:**  
**Method of Delivery by Type of Diabetes**

	Vaginal Delivery	Primary Cesarean Section	Repeat Cesarean Section
Type 1 Diabetes	40%	39%	21%
Type 2 Diabetes	41%	30%	29%
Gestational Diabetes	61%	21%	17%
Impaired Glucose Tolerance	67%	19%	14%
All Sweet Success	58%	22%	19%

Source: CDAPP Data, 2001-2003

**GESTATIONAL AGE  
AT DELIVERY**

Full term birth (delivery between 37 and 41 weeks of gestation or at approximately nine months) is an important predictor of the future health of an infant. Preterm or premature birth is defined as a birth at less than 37 weeks of gestation and is associated with increased neonatal risk of respiratory problems, prolonged hospitalization and infant death. Even birth at near term (35 to 36 weeks of gestation or eight months) is associated with difficulty regulating temperature and blood glucose, increased risk of infection and prolonged hospitalization.

Previously, induced preterm delivery was thought necessary to prevent stillbirth, pregnancy induced hypertension, and macrosomia. Evidence-based guidelines of care have changed practice due to advances in fetal monitoring as well as close maternal monitoring and blood glucose control. The Sweet Success program's goal is to deliver infants at term (by 40 to 41 weeks gestation) to avoid complications.

- ❖ The rate of preterm birth among singletons in the CDAPP population was about ten percent (10.1%).
- ❖ Eighty-nine percent (89.2%) of Sweet Success program clients delivered at term.

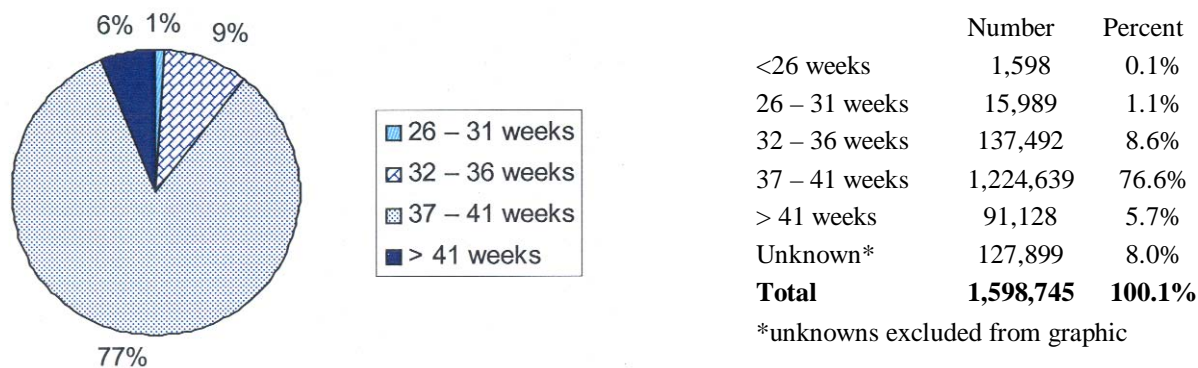


**Figure 8, Table 11: SWEET SUCCESS PROGRAM CLIENTS, 2001-2003:  
Gestational Age at Delivery• (n =20,600)**



Source: CDAPP Data, 2001-2003

**Figure 9, Table 12: CALIFORNIA VITAL STATISTICS, BIRTH CERTIFICATE FILES 2001-2003:  
Gestational Age at Delivery (n =1,598,745)**



Source: California Vital Statistics, Birth Certificate Files, 2001 - 2003

**BIRTHWEIGHT**

Birth weight is an important predictor of outcome for all infants. Infants of diabetic mothers are at increased risk for having low birth weight as well as large for gestational age. The mother's type of diabetes is an important risk factor in identifying the birthweight risk for her child.<sup>4, 6, 8, 42 - 44, 48, 49</sup> Birthweight definitions used in this document are as follows:

- ❖ Normal Birthweight is defined as 2,500 grams (5 pounds, 8 ounces) to 4,000 grams (8 pounds, 13 ounces).
- ❖ Low Birthweight (LBW) is defined as birth weight from 1,500 grams (3 pound 5 ounces) to 2,499 grams (less than 5 pounds, 8 ounces);
  - Very Low Birthweight (VLBW) is defined as 500 grams (1 pound, 1 ½ ounces) to 1,499 grams (3 pounds, 5 ounces) is a subset within LBW.
- ❖ Macrosomia (infant of a large size) is defined as an infant weighing more than 4,500 grams (9 pounds, 15 ounces) at term. As with LBW, the degree of weight difference is vitally important in understanding outcomes:
  - Infants weighing 4,000 grams (8 pounds, 14 ounces) to 4,499 grams (9 pounds, 14 ½ ounces) are at elevated risk for: complications of delivery such as birth trauma, death before delivery or in the first year of life; and long term chronic illness including obesity, diabetes and cardiovascular disease.

Size for gestational age is also an important factor. This measurement allows comparison of weight, length and head circumference among infants of the same gestational age. Differing growth rates can provide important information about the infant's intrauterine environment and are directly related to long term outcomes such as metabolic syndrome.<sup>6, 20, 42-44, 48, 49</sup> Size for gestational age fall into three categories:

- ❖ Average for Gestational Age (AGA) defined as an infant between the 10th and 89th percentile of all infants of the same gestational age for weight, length and/or head circumference.
- ❖ Small for Gestational Age (SGA) defined as an infant within the lowest ten percent of all infants of the same gestational age for weight, length or head circumference.
  - Infants who are SGA can be symmetrically SGA, which means all parameters are within approximately the same growth range; or they can be asymmetrical, which commonly describes an infant who has a lower body weight but normal growth of the head and length. Infants whose growth was impaired so substantially that their brain and skeletal frame are smaller than 90% of others in

the same gestational age are at risk for severe developmental delays.

- ❖ Large for Gestational Age (LGA), defined as an infant having a birthweight that is greater than ninety percent (90%) of other infants with the same gestational age, should not be confused with macrosomia. Macrosomia refers to an infant who has disproportionate weight, generally larger abdomen and chest and typically delivered by mothers with uncontrolled diabetes. These infants are at greater risk for chronic metabolic disease because of their central adiposity. An infant who is LGA can either be macrosomic or be proportionately large, in which case, the newborn does not have the same risks for chronic disease.
  - An infant born near term at 36 weeks gestation (approximately one month early) who has a birth weight of eight pounds (3,600 grams) is still larger than 90% of other infants at that gestational age, even though the birthweight is normal. This rapid intrauterine growth can be an indication that hormones and growth factors the infant was exposed to in-utero were elevated and may impact growth, fat storage and insulin function throughout the infant's life.

### **Causes of Differences in Birthweight**

The causes of LBW and VLBW as well as SGA include: premature birth; intrauterine growth restriction (IUGR); pregnancy induced hypertension (high blood pressure during pregnancy); and placental abnormalities.

Babies born at high birthweight (macrosomia/LGA) are almost always associated with maternal obesity, diabetes or impaired glucose tolerance.

### **Outcome Related to Birthweight**

Nationwide, VLBW infants are 105 times more likely to die in the first month of life as normal birthweight infants.<sup>16</sup> In California, careful analysis of linked birth and death certificates<sup>51</sup> shows that:

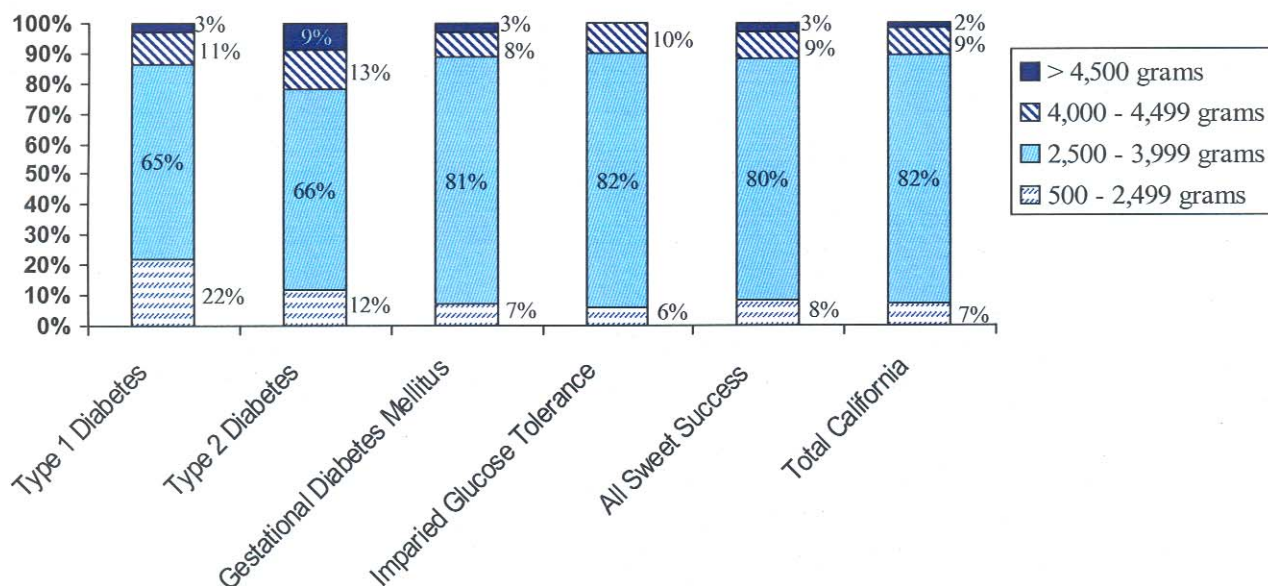
- ❖ The risk of fetal mortality (death of fetus after the 20th week of gestation but before birth) for those weighing:
  - less than 1,500 grams was nearly 178 per 1,000 deliveries;
  - between 1,500 and 2,499 grams was approximately 27 per 1,000;
  - between 2,500 and 3,999 grams was 1 per 1,000;
  - between 4,000 to 4,500 grams was 2 per 1,000; and
  - over 4,500 grams was more than 5 per 1,000.

- ❖ The risk of infant mortality (death of a baby in the first year of life) for babies born weighing:
  - less than 1,500 grams was nearly 143 of every 1,000 deliveries;
  - between 1,500 and 2,499 grams was approximately 9 per 1,000;
  - between 2,500 and 3,999 grams was 1 per 1,000; and
  - between 4,000 and 4,500 grams was 2 per 1,000.
- ❖ Complications are more common when babies are born at the extremes of birthweight.<sup>29, 30, 35</sup>
  - VLBW babies are more likely to have difficulty breathing, infections, serious bleeding inside their brain, intestinal problems, long term eye problems, prolonged hospitalization and many other chronic issues;
  - LBW babies are at increased risk for problems with blood glucose regulation, maintaining a normal temperature, feeding intolerance, jaundice or yellowing of the skin, and prolonged hospitalization; and
  - Macrosomic babies have higher rates of birth defects, birth injuries due to difficult deliveries, problems regulating blood glucose, and stress during labor leading to difficulty breathing.

### **Outcomes for Infants born to Mothers in the Sweet Success Program**

- ❖ Four of five singleton infants, eighty percent (80%), whose mothers participated in the Sweet Success program were born at normal birthweight; eight percent (8%) of singleton babies were born at LBW or VLBW; while twelve percent 12% were macrosomic.
- ❖ Comparing overall CDAPP birthweight distribution to overall birthweight distribution for California singletons during the same period of time, demonstrates one percent or less deviation in all birthweight categories.
  - Infants of mothers with type 1 and 2 diabetes in the Sweet Success program were more likely to have higher rates of LBW, as well as macrosomia.
  - Infants of mothers with GDM and IGT had similar outcomes to that of the general population.

**Figure 10: SINGLETON BIRTHWEIGHT DISTRIBUTION BY SWEET SUCCESS PROGRAM CLIENT, MATERNAL DIABETES TYPE, AND STATE OF CALIFORNIA, 2001-2003♦ (n =20,600 & 1,598,745)**



Source: CDAPP Data, 2001-2003, California Vital Statistics, Birth Certificate Files, 2001 - 2003

**Table 13: SINGLETON BIRTHWEIGHT DISTRIBUTION BY SWEET SUCCESS PROGRAM CLIENT, MATERNAL DIABETES TYPE, AND STATE OF CALIFORNIA, 2001-2003♦ (n =20,600 & 1,598,745)**

	Type 1 Diabetes	Type 2 Diabetes	Gestational Diabetes Mellitus	Impaired Glucose Tolerance	All Sweet Success	Total California
500 - 2,499 grs	22%	12%	7%	6%	8%	7.2%
2,500 - 3,999 grs	65%	66%	81%	82%	80%	82.1%
4,000 - 4,499 grs	11%	13%	8%	10%	9%	9%
> 4,500 grs	3%	9%	3%	0	3%	1.7%

Percents rounded independently

Source: CDAPP Data, 2001-2003

**CONGENITAL  
ANOMALIES  
(BIRTH DEFECTS)**

Congenital anomalies, or birth defects, occur in about three percent (3%) of all pregnancies.<sup>14</sup> Women who have diabetes at the time of conception have an approximate three-fold increased rate of birth defects over that of the general population. This is because birth defect rates increase with increasing HgA1c levels.<sup>13, 22, 24, 32, 33</sup> The increased rate is seen in infants of women with both type 1 and type 2 diabetes with HgA1c levels above 7%. These abnormalities are due to high levels of glucose in the maternal blood stream during organogenesis (formation of the fetus and its organs) rather than chromosomal defects, genetic links or race/ethnicity. Major birth defects associated with diabetes usually occur before nine weeks gestation during the formation of organs and body systems (such as neurological and cardiac).

All women with diabetes between the ages of 13 and 50 years, who can become pregnant, must be supported in family planning and timing issues. Preconception care resulting in normal blood glucose (HgA1c < 7 %) for at least three months before becoming pregnant is the best preventive measure.

- ❖ Sweet Success program data from 2001-2003 demonstrated a two percent (2%) rate of congenital anomalies in the total Sweet Success program population.
  - Women with GDM receiving Sweet Success program care had a nearly two percent (1.5%) rate of congenital anomalies which is consistent with the general population.
  - Women receiving Sweet Success care with preexisting diabetes had nearly a seven percent (6.5%) congenital anomaly rate, compared to the expected nine percent (~9%) rate.<sup>3, 13, 22, 24</sup> Caution should be used in interpreting these results as numbers are small and identification of birth defects may have occurred after follow-up care and data collection. Additionally, forty eight percent (48%) of women with pre-existing diabetes in the Sweet Success program entered pregnancy with HgA1c below seven percent (7%), thus in a reduced risk category.



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## APPENDIX A

## CDAPP DATA COLLECTION FORM

CALIFORNIA DIABETES AND PREGNANCY PROGRAM DATA FORM 2001	
1. Affiliate (Person Completing Form)	
2. County 3. Region 4. Affiliate 5. Satellite 6. Reporting Date (MM/DD/YY)	
CLIENT INFO	
7. Client's Current Zip Code	8. Grav 9. Para 10. EDD (MM/DD/YY) 11. Date of Delivery (MM/DD/YY)
12. Pre-pregnant Wt	13. Height (") 14. Place of Birth 15. Date of Birth 16. Date GDM Dx by Lab (MM/DD/YY)
17. Client: <input type="radio"/> Lost to follow-up <input type="radio"/> Transferred during care <input type="radio"/> Neither	
18. Referral Date (MM/DD/YY) 19. Date of First (SS) Visit (MM/DD/YY)	
20. Race/Ethnicity (May choose up to 3)	
<input type="radio"/> Black/African American <input type="radio"/> Hispanic/Latina <input type="radio"/> Hawaiian Native/Pacific Islander <input type="radio"/> American Indian/Alaskan Native <input type="radio"/> Far East Asian <input type="radio"/> Southeast Asian <input type="radio"/> Asian Indian/Indian Sub-Continent <input type="radio"/> White <input type="radio"/> Unknown <input type="radio"/> Other	
21. Primary Language	
<input type="radio"/> English <input type="radio"/> Spanish <input type="radio"/> Unknown <input type="radio"/> Other	
22. Education level	
<input type="radio"/> No Schooling <input type="radio"/> K - 3 <sup>rd</sup> Grade <input type="radio"/> 4 - 8 <sup>th</sup> Grade <input type="radio"/> 9 - 12 (w/o Graduation) <input type="radio"/> High School Grad or GED <input type="radio"/> Some College <input type="radio"/> College Graduate/Post Graduate <input type="radio"/> Unknown	
23. DM 1st Visit: <input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9	
If Glyburide, check here <input type="checkbox"/> If other oral, check here <input type="checkbox"/> If insulin pump, check here <input type="checkbox"/>	
24. DM Last Visit: <input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9	
If Glyburide, check here <input type="checkbox"/> If other oral, check here <input type="checkbox"/> If insulin pump, check here <input type="checkbox"/>	
25. DM Postpartum: <input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9	
If Glyburide, check here <input type="checkbox"/> If other oral, check here <input type="checkbox"/> If insulin pump, check here <input type="checkbox"/>	
26a. Last SS Visit	26b. At Delivery
26. Weeks Gestation:	27. Weight in Pounds:
27a. First SS Visit	27b. Last SS Visit
28. Prenatal hospitalization to control diabetes? <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unknown	
BIRTH INFO	
29. Pregnancy outcome: <input type="radio"/> Live Birth <input type="radio"/> Fetal Death <input type="radio"/> Spontaneous Abortion <input type="radio"/> Unknown	
30. Multiple Birth: <input type="radio"/> No <input type="radio"/> Yes, Specify number <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 or more <input type="radio"/> Unknown	
31. This form filled out for baby: <input type="radio"/> Single birth or 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 or more	
32. Method of delivery: <input type="radio"/> Vaginal <input type="radio"/> VBAC <input type="radio"/> C/S, Primary <input type="radio"/> C/S, Rep <input type="radio"/> Unknown	
33. Birth weight in grams:	
34. Neonatal Intensive Care: <input type="radio"/> Not Admitted <input type="radio"/> Observed <input type="radio"/> Admitted <input type="radio"/> Unknown	
35. Congenital anomalies: <input type="radio"/> Unknown <input type="radio"/> No <input type="radio"/> Yes	
PRE-EXISTING DIABETES ONLY	
36. Preconception care for DM 1 or 2 only: <input type="radio"/> Unknown <input type="radio"/> No <input type="radio"/> Yes	
37a. HbA1c at 1 <sup>st</sup> Prenatal Visit:	37b. Date of HbA1c:

EFFECTIVE April 01, 2001

**APPENDIX B****LIST OF ABBREVIATIONS**

AGA	Average for Gestational Age
BA	Bachelors Degree
BMI	Body Mass Index
CDAPP	California Diabetes in Pregnancy Program
CDE	Certified Diabetes Educator
C/S	Cesarean Section
FNP	Family Health Nurse Practitioner
GA	Gestational Age
GDM	Gestational Diabetes Mellitus
HgA1c	Hemoglobin A1c
IGT	Impaired Glucose Tolerance
IUGR	Intrauterine Growth Restriction
LBW	Low Birthweight
LGA	Large for Gestational Age
MA	Masters of Arts Degree
MHA	Masters of Healthcare Administration Degree
MSN	Masters Science, Nursing Degree
NIH	National Institutes of Health
OGTT	Oral Glucose Tolerance Test
PhD	Doctorate of Philosophy Degree
PHN	Public Health Nurse
PIH	Pregnancy Induced Hypertension
RD	Registered Dietician
RN	Registered Nurse
SGA	Small for Gestational Age
SMBG	Slef Monitoring of Blood Glucose
VBAC	Vaginal Birth after Cesarean Section
VLBW	Very Low Birthweight
WHO	World Health Organization